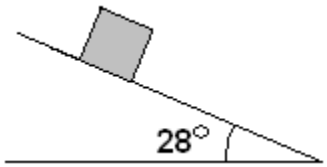
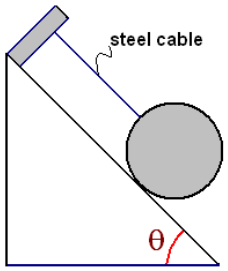
Physics I

Inclines

Problem 1.- Draw a free body diagram of the box shown in the figure and calculate its acceleration if it is sliding down the slope without friction.

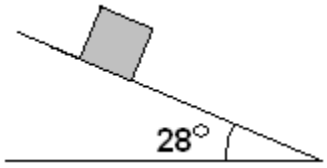


Problem 2.- The figure shows a 1500-kg sphere leaning against a frictionless surface and held in place by a steel cable which is parallel to the surface. Find the tension on the cable if the angle $\theta = 48^\circ$

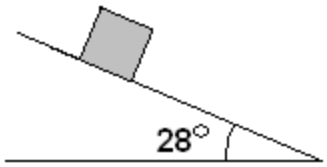


Problem 3.- The box in the picture has a mass of 15kg and it is in equilibrium (its acceleration is zero).

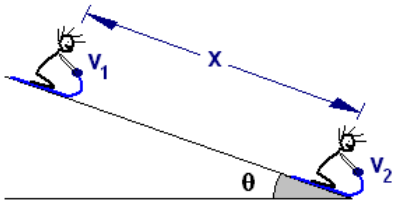
i) Draw the free body diagram of the object, showing all the forces and angles.
ii) Calculate the friction force.



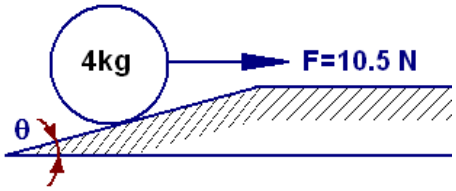
Problem 3a.- The box in the picture has a mass of 15kg and is sliding down with zero acceleration. Draw the free body diagram of the object, showing all the forces, and calculate the friction force.



Problem 4.- A sled starts down a slope with an initial velocity $\mathbf{v_1 = 4m/s}$. Calculate its final velocity after sliding **x = 12m** if the angle of the incline is $\mathbf{\theta = 22^o}$ and the coefficient of kinetic friction is $\mathbf{\mu_k = 0.2}$

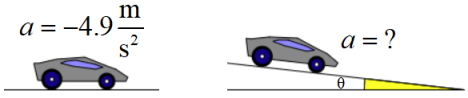


Problem 5.- Calculate the angle θ, knowing that the horizontal force necessary to keep the sphere from moving is 10.5 N.
Consider the friction between the sphere and the inclined surface to be zero.



Problem 6.- In building the pyramids of Egypt a theory proposes that 25 people would pull a 2,500 kg block up an incline at a 28° angle. Neglecting friction estimate the force applied by each person.

Problem 7.- On a level road a car can decelerate at $a = -4.9\frac{m}{s^2}$ without skidding. With that information calculate the maximum possible deceleration if the road is inclined $\theta = 6.4^\circ$ downhill. Assume the value of μ_s is the same.



Problem 8.- Take the coefficient of static friction between rubber and wet asphalt to be $\mathbf{\mu_s = 0.35}$, with these conditions find the maximum angle of inclination that a car can climb.